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GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT INITIATION

Date: 12/30/71

Project Title: Noise Exposure Meter

Project No.: A-1386

Project Director: Mr. L. C. Young

Sponsor: Scientific-Atlanta, Inc.

Effective December 15, 1971 Estimated to run until: March 14, 1972

Type Agreement: Standard Industrial Amount: $ 4,970

Reports: Monthly Progress Reports
Final Report

Contact Person: Mr. Howard Crispin, Vice President
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Assigned to Physical Sciences Division

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A-1386

ENGINEERING EXPERIMENT STATION

GEORGIA INSTITUTE of TECHNOLOGY

Physical Sciences Division

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January 12, 1972

Mr. Howard Crispin
Vice President, Corporate Development
Scientific Atlanta, Inc.
Box 13654
Atlanta, Georgia 30332

Subject: Monthly Progress 1; Project A-1386,--Noise Exposure Meter

Dear Mr. Crispin:

Progress on the subject meter has been in two basic areas and is amplified in the attached pages.

The first of these areas and that most recently started pertains to Roger Woodward's definition of the circuit characteristics and requirements. Mr. Woodward is, of course, continuing on the development of the several component portions within this area.

The second pertains to the potential market for the meter. It is essentially a listing of the many occupations measured acoustically in an Armour Research Foundation study reported in 1953. The measurements have been transcribed into the dBA scale employed in the OSHA act, and equivalent exposure times have been computed. The only further step which will be taken on this will be a search to determine whether any census figures have been tabulated on the specific occupations listed; at this time, I do not believe that these are available.

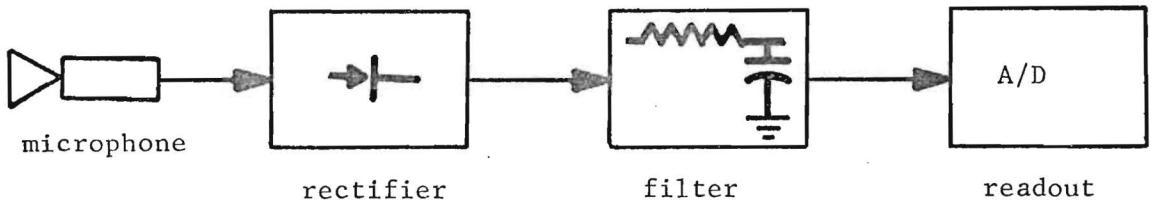
Very truly yours,

Louis C. Young
Project Director

LCY/ml

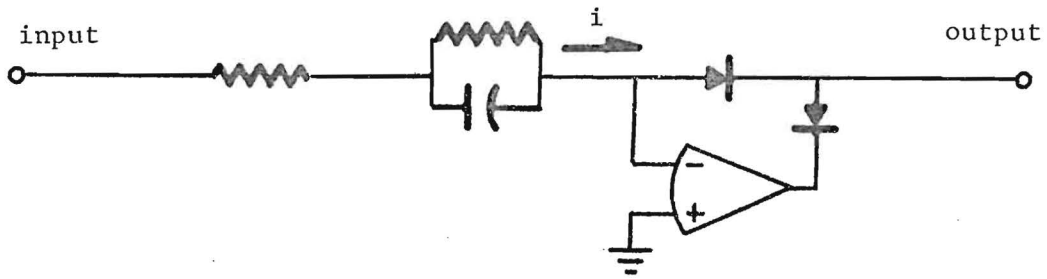
Electronic Circuit

The electronic circuit for the noise dosimeter may be partitioned into four blocks.



The microphone must be small, inexpensive, rugged and have satisfactory sensitivity and frequency response. At least one type of microphone which appears satisfactory is the dynamic, or magnetic, type. This type is readily available and easy to work with. The fundamental response frequency characteristic closely matches the "A" weighting scale required. A typical sensitivity factor is -60db relative to 1 volt rms per microbar sound pressure.

The rectifier block includes the frequency filtering required to match the "A" scale, preamplification, and rectification of the microphone signal. A prototype circuit based on a standard operational amplifier combines all three functions.



The input current i has a frequency response function matching the "A" scale. When $i > 0$, the output voltage is given by

$$e_o = -K \log i$$

because of the exponential nature of the current-voltage relationship for a semiconductor pn junction. When $i < 0$,

$$e_o = 0.$$

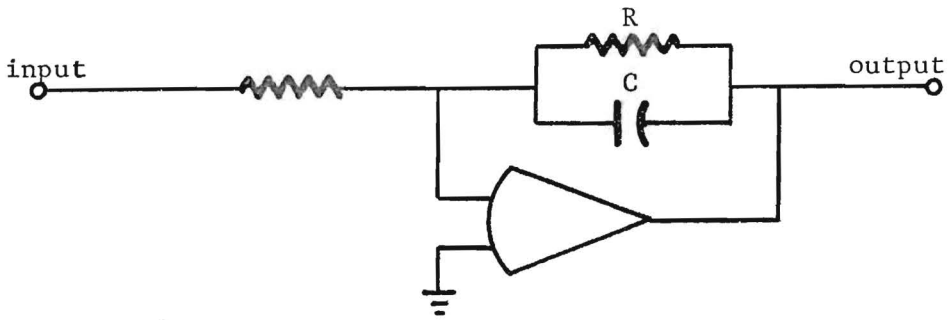
Thus, over a time average we have

$$e_o = -\tfrac{1}{2} K \log i$$

where K is a scale factor.

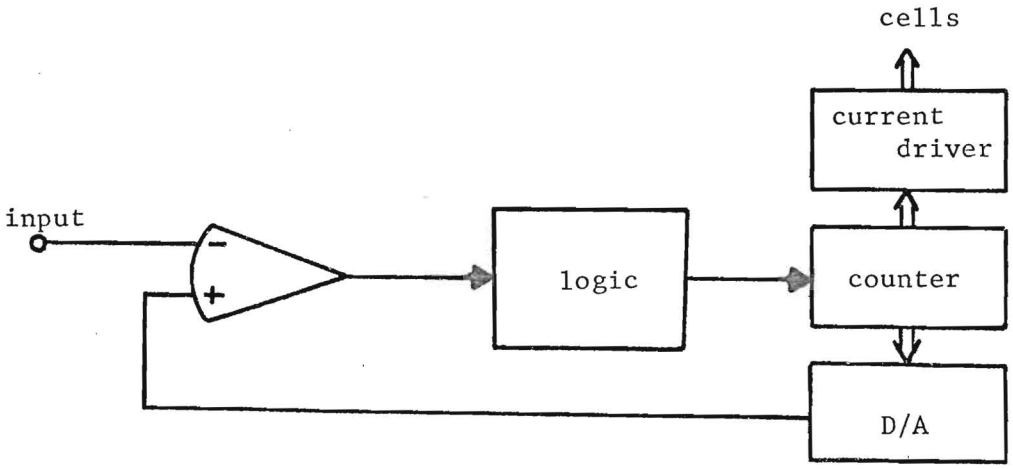
Output from a -60db microphone will be 6.4mV @ 90db sound level (@ 1000Hz, where the "A" weighting factor has 0db attenuation) and 112mV @ 115db. These levels are sufficient to overcome amplifier offsets and therefore allow direct coupling.

The filter block will provide the "slow" response required by the OSHA law. A prototype circuit is a straightforward operational R-C filter.



This block will also provide about 20db voltage gain.

The readout block is an analog-to-digital converter with current drivers to the cells. The prototype circuit is a D/A feedback converter.



The input operational amplifier acts as an analog comparator. When the error voltage exceeds a preset limit, the logic corrects the counter state so as to satisfy the comparator.

While this portion of the circuitry is not at all finalized, it appears that a ring counter will be the best choice. A ring counter, with only one element high at a time, simplifies the D/A converter current driver designs since no decoding is required.

Potential Areas

for utilization of the

Noise Exposure Meter

as listed in and computed from data of

"A Noise Survey of Manufacturing Industries"
Karplus, H. B., and G. L. Bonvallet. Industrial
Hygiene Quarterly, 14:4 December, 1953.

Employment data quoted from U.S. Census, 1967.

FOOD 1121 THOUSAND PRODUCTION WORKERS

MACHINES	NOISE DBA	TOL. HOURS
1 CHOP CUT MACHINE, MEAT	93.1	5.2 **
2 CANNING MACHINE, MEAT	91.8	6.2 **
3 VACUUM MIXER, MEAT	97.0	3.1 **
4 SAUSAGE MACHINE	81.4	8.0
5 BACON PRESSER	88.2	8.0 *
6 HAM CAN CLEANER	85.6	8.0
7 FUDGE MOLDING MACHINE	88.3	8.0 *
8 CANDY WRAPPER	88.0	8.0 *
9 PEANUT BLANCHING MACHINE	89.1	8.0 *
10 COVERING CANDY WITH NUTS	86.9	8.0

AREAS	NOISE DBA	TOL. HOURS
1 SAUSAGE KITCHEN	92.3	5.8 **
2 MEAT PREPARATION ROOM	91.4	6.6 **
3 BACON SLICING ROOM	80.1	8.0
4 CANNING AREA	73.7	8.0
5 SAUSAGE MAKING ROOM	58.0	8.0
6 CHOCOLATE COATING	86.1	8.0
7 CANDY MIXING	76.0	8.0
8 PACKING DEPARTMENT	80.2	8.0
9 BLANCHING AND ROASTING	86.1	8.0
10 CHOCOLATE MELTER AND MIXING PIT	83.8	8.0
11 X-RAY ROOM	75.2	8.0
12 COVERING CANDY WITH NUTS	84.1	8.0

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

TEXTILES 828 THOUSAND PRODUCTION WORKERS

MACHINES	NOISE DBA	TOL. HOURS
1 REDUCING MACHINES, 72 SPINDLE	92.6	5.6 **
2 REDUCING MACHINE, 60 SPINDLE	97.5	2.8 **
3 REDUCER TRANSFER MACHINE	90.7	7.3 **
4 SPEEDER MACHINE, YARN PROCESSING	99.3	2.2 **
5 COMBING MACHINES	94.0	4.6 **
6 PIN DRAFTERS	93.2	5.1 **
7 PREPARERS	98.3	2.5 **
8 FINISHERS	99.8	2.1 **
9 SPINNING FRAMES	82.1	8.0
10 TWISTERS, UNIVERSAL	85.7	8.0
11 TWISTERS, CAP TYPE	90.9	7.0 **
12 RING SPINNING	86.6	8.0
13 CARDING AREA	82.9	8.0
14 COMBING MACHINES	87.9	8.0 *
15 PREPARERS	92.6	5.6 **
16 WOVEN MATERIAL WASHING AREA	94.3	4.4 **
17 DRAWING AREA	93.9	4.7 **
18 WEAVING SHED	103.5	1.2 **

AREAS	NOISE DBA	TOL. HOURS
1 COMBING MACHINES	94.0	4.6 **
2 PIN DRAFTERS	93.2	5.1 **
3 FINISHERS	99.8	2.1 **
4 SPINNING FRAMES	82.1	8.0
5 RING SPINNING	89.4	8.0 *
6 REELERS	80.2	8.0
7 CARD MACHINES	83.2	8.0
8 COMBING MACHINES	95.1	3.9 **
9 DRY FINISH AREA	80.2	8.0
10 DYE HOUSE AREA, NOISE OF PREPARER	83.6	8.0
11 WEB FINISH AREA	83.2	8.0
12 DRAWING ROOM	88.8	8.0 *
13 SPINNING MACHINES	81.7	8.0
14 STORAGE ROOM, MACHINES ON FLOOR	86.5	8.0
15 WEAVING SHED, LOOMS	102.5	1.4 **

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

APPAREL 1200 THOUSAND PRODUCTION WORKERS

MACHINES	NOISE DBA	TOL. HOURS
1 SEWING MACHINE, MEN S GARMENTS	82.3	8.0
2 BUTTON HOLER, GARMENTS	83.0	8.0
3 FABRIC CUTTER, GARMENTS	92.1	5.9 **
4 FABRIC CUTTER, GARMENTS	86.7	8.0
5 SEWING MACHINE, GARMENTS	81.9	8.0

AREAS	NOISE DBA	TOL. HOURS
1 SEWING MACHINES, WEARING APPAREL	71.9	8.0
2 BUTTON HOLERS, WEARING APPAREL	71.2	8.0
3 SEWING MACHINES, WEARING APPAREL	75.2	8.0

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

LUMBER AND PRODUCTS 496 THOUSAND PRODUCTION WORKERS

MACHINES	NOISE DBA	TOL. HOURS
1 WOOD PLANER	109.1	.6 **
2 CIRCULAR CUT-OFF SAW	108.1	.7 **
3 DRUM BARKER	91.0	7.0 **
4 SLASHER	98.9	2.3 **
5 DRUM SANDER	85.9	8.0
6 FINISHING PLANER	88.6	8.0 *
7 JOINTER	87.8	8.0 *
8 DRUM SANDER	77.9	8.0
9 SHAPER, MOULDING MILLWORK	91.6	6.4 **
10 DOUBLE SURFACER	99.9	2.3 **
11 CUT-OFF SAW	84.9	8.0
12 PLANER	97.0	3.0 **
13 SANDER	86.2	8.0
14 SHAPER, PINE MILLWORK	94.0	4.6 **
15 STICKER MOULDER, SHAPING FURNITURE	102.0	1.5 **
16 PLANER FURNITURE PARTS	112.0	.4 **
17 DOUBLE-ENDED TENONER, FURN. RAILS	96.0	3.5 **
18 CUT-OFF SAW, COMP. AIR, FURN. PART	106.9	.8 **
19 SURFACER	103.8	1.2 **
20 AUTOMATIC LATHE, BIRCH BED POSTS	99.6	2.1 **
21 JOINTER, IDLING	91.3	6.7 **
22 DRUM SANDER	96.4	3.3 **
23 DOUBLE ENDED TENONER, FURNITURE	94.9	4.1 **
24 SHAPER, FURNITURE COMPONENTS	85.8	8.0
25 PLANER, MAPLE FURNITURE	104.0	1.2 **
26 MOLDER MAPLE FURNITURE	101.2	1.7 **
27 PLANER, FURN. COMP, HARD WOOD	101.3	1.7 **

AREAS	NOISE DBA	TOL. HOURS
1 MILL SHOP, JOINERS, PLANERS, ETC.	86.3	8.0
2 CARPENTER SHOP DISTANT NOISE ONLY	63.8	8.0
3 LOG SAWING BARKING CUTTING KNOTS,	95.1	3.9 **
4 WOOD FINISHING SANDING PLANING	76.7	8.0
5 WOOD FINISHING SANDING PLANING	70.6	8.0
6 WOOD FINISHING SANDING PLANING	80.3	8.0
7 FURN MAKING PLANERS JOINTERS SAWS	99.0	2.3 **
8 FURN MAKING PLANERS JOINTERS SAWS	90.4	7.6 **
9 FURNITURE MAKING LATHES SAWS ETC	99.7	2.1 **
10 VENEER DEPT. VENEER MACH. PRESSES	73.2	8.0
11 FURNITURE MAKING PLANERS SHAPERS	94.9	4.1 **
12 FURNITURE MAKING PLANERS SHAPERS	77.7	8.0
13 FURNITURE MAKING PLANERS SHAPERS	90.4	7.5 **
14 FURNITURE MAKING PLANERS SHAPERS	89.6	8.0 *
15 SPRAYING VARNISH AIR EXHAUST ETC	84.1	8.0

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

PAPER, PRINTING, AND PUBLISHING — 1139 THOUSAND PRODUCTION WORKERS

MACHINES		NOISE DBA	TOL. HOURS
1	DRUM BARKER, TUMBLING LOGS	91.0	7.0 **
2	SLASHER	98.9	2.3 **
3	WET MACHINE, PULP PREPARATION	83.3	8.0
4	STOCK MIXER 300 HP. PULP PROCESS	94.0	4.6 **
5	PAPER MACHINE	88.5	8.0 *
6	CALENDER CLUTCH AND GEAR NOISE	94.1	4.5 **
7	SUCTION PUMP FOR PAPER MACHINE	92.2	5.9 **
8	PRINTER-SLOTTER PRINTS SLOTS	97.9	2.7 **
9	BOX STITCHER, STITCHES CARTONS	86.9	8.0
10	FOLDER, AUTOMATIC TAPER (CARTONS)	93.1	5.2 **
11	FOLDER, AUTOMATIC TAPER (CARTONS)	91.0	7.0 **
12	CORRUGATOR DOUBLE CORR. CARDBOARD	97.3	2.9 **
13	CORRUGATOR, AS 12 CUTTING END	90.5	7.5 **
14	CORRUGATOR, SINGLE	82.5	8.0
15	PRINTER-SLOTTER PRINTS SLOTS	81.4	8.0
16	TRIMMER SECTION PAMPHLET STITCHER	89.2	8.0 *
17	FOLDER LARGE SHEET NOISE DUE TO	93.8	4.7 **
18	FOLDER LARGE SHEET NOISE DUE TO	92.4	5.7 **
19	SHEAR IDLING NOISE DUE TO WORN	100.7	1.8 **
20	TWO-COLOR PRESS	88.3	8.0 *
21	TWO-COLOR ROTARY PRESS	86.0	8.0
22	TWO-COLOR PRESS	89.7	8.0 *
23	LETTER PRESS. SIZE 6/0	90.6	7.4 **
24	FOUR-COLOR OFFSET PHOTOGRAPHY	90.3	7.7 **
25	INK MILL NOISE OF WORN PARTS	90.5	7.5 **
26	CLEANING TANK, STEAM NOISE	79.9	8.0
27	PRINTER-SLOTTER CARDBOARD BOXES	97.9	2.7 **
28	METAL STITCHER	86.7	8.0
29	COMBINING MACH. PASTING MULTI-PLY	89.3	8.0 *
30	PAPER MACHINE	95.3	3.8 **
31	PAPER MACHINE	87.5	8.0 *
32	PAPER MACHINE	90.8	7.1 **
33	PULP GRINDER	100.5	1.9 **
34	NEWSPAPER PRESS STANDARD TYPE	94.6	4.2 **
35	NEWSPAPER PRESS STANDARD TYPE	95.5	3.7 **
36	NEWSPAPER PRESS STANDARD TYPE	92.0	6.1 **
37	NEWSPRINT REWINDER	82.0	8.0
38	LINOTYPE MACHINE	77.8	8.0
39	AIR EJECTOR, CLEANING	80.8	8.0

AREAS		NOISE DBA	TOL. HOURS
1	WET MACHINES PAPER MAKING	82.6	8.0
2	BEATER ROOM PULPING MACHINES	83.5	8.0
3	PAPER MACHINE	88.5	8.0 *
4	CALENDERS	81.7	8.0
5	PAPER MACH AUXILIARY EQUIP PUMPS	89.5	8.0 *

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

		NOISE DBA	TOL. HOURS	
6	CARDBOARD BOX FOLDING AND TAPING	85.6	8.0	
7	CORRUGATOR	81.2	8.0	
8	FOLDING AREA PAPER FOLDERS LARGE	91.0	6.9	**
9	CUTTING AREA NUMEROUS PAPER SHEAR	85.0	8.0	
10	PRESSROOM TWO COLOR PRINTING	83.7	8.0	
11	OFFSET PRESSROOM, SEVERAL PRESSES	62.0	8.0	
12	ROTO PRESS ROOM	62.5	8.0	
13	INK ROOM	83.0	8.0	
14	PRINTING-SLOTTING AREA	90.3	7.7	**
15	METAL STITCHING	82.2	8.0	
16	SHIPPING ROOM	66.9	8.0	
17	COMBINING AREA PASTERS MIXERS	89.3	8.0	*
18	PAPER MACHINE	95.3	3.8	**
19	PAPER MACHINE	87.5	8.0	*
20	PAPER MACHINE	90.8	7.1	**
21	BEATER ROOM PULPING MACHINE	76.1	8.0	
22	PROOF ROOM NOISE OF MESSAGE	62.5	8.0	
23	PRESSROOM NEWSPAPER PRESSES	86.9	8.0	
24	PAPER STORAGE TRUCKS CONVEYORS	81.2	8.0	
25	MAIL ROOM PAPER BUNDLING MACHINES	75.9	8.0	
26	GALLEY ROOM	74.6	8.0	
27	ASSOC. PRESS ROOM TELETYPE MACH	63.7	8.0	
28	PHOTOGRAPHY DEPT DISTANT NOISE	58.1	8.0	
29	STEREOTYPE ROOM WORKING PRINTING	82.4	8.0	
30	COMPOSING ROOM	73.2	8.0	
31	LINOTYPE MACHINES	75.2	8.0	

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

CHEMICALS 541 THOUSAND PRODUCTION WORKERS

MACHINES		NOISE DBA	TOL. HOURS
1	INK MILL NOISE OF WORN PARTS	90.5	7.5 **
2	PIGMENT MILLS STEEL BALL GRINDING	93.2	5.1 **
3	PEBBLE MILL	79.2	8.0
4	MIXER ENAMEL COMPONENTS	80.1	8.0
5	DRUM CLEANING	81.9	8.0
6	PIGMENT MILL ENAMEL GRINDING	79.7	8.0
7	FIVE-ROLL MILL	101.4	1.6 **
8	HAMMERMILL	101.9	1.5 **
9	BOILER ROOM, BLOWER	94.3	4.4 **
10	COMPOUNDING ROLL PLASTIC COMP.	91.9	6.1 **
11	BALL MILL, PLASTIC COMPONENTS	101.0	1.7 **
12	FABRIC COATING, HIGH TEMP. TYPE	78.8	8.0
13	FABRIC COATING, LOW TEMP. TYPE	85.0	8.0
14	FABRIC COATING, LOW TEMP. TYPE	83.3	8.0
15	REWIND, FABRIC BEAMING	82.4	8.0
16	ROTARY KILN	83.0	8.0
17	RUBBER MILL, TIRE RUBBER	89.6	8.0 *
18	TREAD TUBERS, MAKING TIRE CASINGS	91.0	6.9 **
19	CURING PRESS, RUBBER TIRE PROC	94.6	4.2 **
20	HEAVY SERVICE CURING, RUBBER TIRE	84.6	8.0

AREAS		NOISE DBA	TOL. HOURS
1	INK MILL ROOM	83.0	8.0
2	PIGMENT GRINDING	91.5	6.5 **
3	PEBBLE MILLS	74.1	8.0
4	ENAMEL MIXING	70.5	8.0
5	PAINT DRUM CLEANING	81.9	8.0
6	ENAMEL COMPONENT GRINDING	70.2	8.0
7	ROTARY KILNS, HEAVY CHEMICAL	83.0	8.0
8	VIBRATOR HEAVY CHEMICALS CONVEYOR	87.5	8.0 *
9	MIXER, HEAVY CHEMICALS	92.9	5.3 **
10	GAS COMPRESSOR ROOM	88.2	8.0 *
11	CATALYTIC CRACKING AREA PETROLEUM	101.5	1.6 **
12	PULVERIZING ROOM, BALL MILL COMP.	100.5	1.9 **
13	PLASTIC MOLDING AREA	89.6	8.0 *
14	RUBBER MILL DEPARTMENT	84.4	8.0
15	TREAD TUBERS AREA	91.0	6.9 **
16	TIRE MAKING	94.1	4.5 **
17	TIRE MAKING	92.9	5.4 **
18	CURING AREA LARGE CURING PRESSES	93.1	5.2 **
19	CURING AREA, CURING PRESSES MISC.	84.6	8.0
20	TIRE MAKING	80.6	8.0
21	RUBBER PLY BUILDING AND CUTTING	88.2	8.0 *

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

LEATHER 293 THOUSAND PRODUCTION WORKERS

	MACHINES	NOISE DBA	TOL. HOURS	
1	FLESHING MACHINE	91.0	7.0	**
2	HAIR DRYER	86.7	8.0	
3	LIME MIXING TUB, HIDE PROC. TANK	77.0	8.0	
4	SETTING OUT MACHINE, LEATHER PROC	85.1	8.0	
5	SPLITTING MACHINE	87.4	8.0	*
6	COLORING DRUMS	88.4	8.0	*
7	SETTING MACHINE	106.2	.8	**
8	PLATING PREPARING LEATHER SURFACE	83.6	8.0	
9	PLATING PREPARING LEATHER SURFACE	74.8	8.0	
10	FINE HAIRING	79.9	8.0	
11	SEASONING MACHINE	79.2	8.0	
12	SPRAYING MACHINE	80.2	8.0	
13	MEASURING MACHINE	63.3	8.0	

	AREAS	NOISE DBA	TOL. HOURS	
1	HIDE STORAGE	65.5	8.0	
2	LOADING AREA	66.9	8.0	
3	HIDE TRIMMING	70.3	8.0	
4	FLESHING, CLIPPING	88.1	8.0	*
5	UNHAIRING MACHINE	80.7	8.0	
6	TANNING DEPARTMENT	83.6	8.0	
7	WRINGING	87.0	8.0	
8	SETTING OUT DEPT, HIDE SMOOTHING	84.6	8.0	
9	SHAVING, SPLITTING	82.5	8.0	
10	DRUM COLORING	87.3	8.0	*
11	HIDE PROCESSING, DRYING	83.5	8.0	
12	SETTING, CUTTING OFF HAIRS	90.2	7.8	**
13	DRYING LOFT	82.7	8.0	
14	POWER HOUSE	96.5	3.3	**
15	PLATING, PREPARING SURFACE	83.6	8.0	
16	STAKING, STRETCHING, SMOOTHING	75.8	8.0	
17	BUFFING AND BRUSHING	85.3	8.0	
18	SEASONING, HIDE PREPARATION	75.7	8.0	
19	TRIMMING MANUAL	66.3	8.0	
20	LEATHER SORTING, DISTANT NOISES	53.7	8.0	
21	BUNDLING, PACKAGING	62.7	8.0	
22	SHIPPING DEPARTMENT	60.5	8.0	
23	LIME PROCESSING	73.9	8.0	

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

STONE, CLAY, AND GLASS — 469 THOUSAND PRODUCTION WORKERS

MACHINES		NOISE DBA	TOL. HOURS
1	CLAY CRUSHER	94.1	4.5 **
2	CLAY TILE EXTRUSION MACHINE	84.0	8.0
3	PACKING MACHINE, GLASS JARS	90.9	7.1 **
4	BOTTLE FORMING, GLASS	99.1	2.3 **
5	MIXER, GLASS COMPONENTS	92.9	5.4 **
6	BOTTLE FORMING, GLASS	96.4	3.3 **
7	CARVING STONE, PNEUMATIC CHIPPER	89.0	8.0 *
8	CUTTING STONE	91.5	6.5 **
9	CUTTING STONE	91.1	6.8 **
10	STONE PLANER, FLAT	88.9	8.0 *
11	STONE PLANER,	99.9	2.0 **
12	CRANE	88.7	8.0 *
13	CRANE	89.4	8.0 *
14	CUTTING LARGE STONE	99.2	2.2 **
15	LIGHT WEIGHT CONCRETE AGGREGATE	92.2	5.9 **
16	CLAY TILE KILN (UNLOADING)	97.4	2.9 **

AREAS		NOISE DBA	TOL. HOURS
1	CLAY CRUSHING	94.1	4.5 **
2	CLAY TILE EXTRUSION DEPARTMENT	74.1	8.0
3	BOILER ROOM, CLAY PRODUCTS PLANT	81.1	8.0
4	TILE MOLDING	74.3	8.0
5	DRYING ROOM, CLAY TILE	67.6	8.0
6	CLAY TILE KILN, UNLOADING	67.2	8.0
7	GLASS JAR MOLD SHOP	84.0	8.0
8	GLASS JAR MOLD CLEANING SHOP	89.1	8.0 *
9	GLASS JAR PACKING DEPARTMENT	82.7	8.0
10	BOTTLE FORMING	111.5	.4 **
11	BATCH HOUSE, GLASS JAR PLANT	88.0	8.0 *
12	MIXING AREA, GLASS JAR PLANT	92.9	5.4 **
13	STONE CARVING AREA	84.9	8.0
14	STONE PLANING AREA	85.7	8.0
15	NEAR CRANE	91.1	6.8 **

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

PRIMARY METALS 1042 THOUSAND PRODUCTION WORKERS

MACHINES	NOISE DBA	TOL. HOURS
1 PNEU. CHIP.	121.3	.1 **
2 PED. GRINDER	92.1	5.9 **
3 FURNACE	95.5	3.7 **
4 FURNACE	94.6	4.2 **
5 WOOD PLANER	109.0	.6 **
6 FRICTION SAW	108.1	.6 **
7 SHAKEOUT, 50 SQ. FT.	108.5	.6 **
8 PNEUMATIC RAM	88.7	8.0 *
9 SHAKEOUT, 40 SQ. FT.	105.0	1.0 **
10 TUMBLER	101.2	1.7 **
11 PNEUMATIC CHIPPER	112.0	.4 **
12 PUSH UP MACHINE	100.2	1.9 **
13 CORE BLOWER	116.7	.2 **
14 CORE DRAW VIBRATOR	109.9	.6 **
15 SHAKEOUT	98.5	2.5 **
16 PNEU. CHIPPER	101.2	1.7 **
17 PNEUMATIC CHIPPER	113.6	.3 **
18 AIR HOIST, 2000 LB., PNEUMATIC	109.7	.5 **
19 STAND GRINDER	93.4	5.0 **
20 ELECTRIC FURNACE	99.6	2.1 **
21 SAND SLINGER	98.4	2.5 **
22 JOLT SQUEEZE MACHINE	99.7	2.1 **
23 SHAKEOUT	108.7	.6 **
24 PRE-MIX BURNER	85.5	8.0
25 ROUGHING MILL	105.7	.9 **
26 LEVELER	92.7	5.5 **
27 DECOILER	116.7	.2 **
28 ANNEAL. FURN.	92.3	5.8 **
29 LECTROMELT FURNACE	95.0	4.0 **
30 OPEN HEARTH	80.2	8.0
31 SCARFING, ACETYLENE WELD. EQUIP.	91.4	6.6 **
32 BLOOMER MILL, STRIP STEEL	91.0	7.0 **
33 STRIP MILL, STEEL	97.1	3.0 **
34 CONVEYOR, STRIP STEEL	99.7	2.1 **
35 FURNACE	91.9	6.1 **
36 FORGING HAMMER	109.0	.6 **
37 FORGING MANIPULATOR	100.2	1.9 **

AREAS	NOISE DBA	TOL. HOURS
1 CHIPPING AREA	104.5	1.1 **
2 GRINDING AREA	92.3	5.8 **
3 FRICTION SAW AREA	89.5	8.0 *
4 SHAKEOUT AREA	108.5	.6 **
5 PNEUMATIC RAMMING	88.8	8.0 *
6 SHAKEOUT AREA	99.7	2.1 **
7 TUMBLERS	101.2	1.7 **

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

		NOISE DBA	TOL. HOURS	
8	SHOT BLAST ROOM	98.6	2.4	**
9	MOLDING AREA	100.2	1.9	**
10	CORE ROOM	92.2	5.9	**
11	CORE ROOM, MISC. FOUNDING EQUIP.	86.0	8.0	
12	CORE ROOM, CORE DRAW VIBRATORS	86.2	8.0	
13	SHAKEOUT AREA	87.2	8.0	*
14	CASTING CLEANING AREA	95.1	3.9	**
15	GRINDING AREA	89.9	8.0	*
16	ELECTRIC FURNACE AREA	99.6	2.1	**
17	SAND SLINGER AREA	85.6	8.0	
18	STEEL POURING AREA	83.0	8.0	
19	ROUGHING MILL AREA	93.1	5.2	**
20	STEEL HANDLING AREA	85.3	8.0	
21	ANNEALING FURNACE AREA	79.3	8.0	
22	LECTROMELT FURNACE AREA	89.0	8.0	*
23	LECTROMELT FURNACE AREA	83.6	8.0	
24	OPEN HEARTH AREA	80.2	8.0	
25	SCARFING AREA	75.7	8.0	
26	BLOOMER MILL AREA	91.0	7.0	**
27	STRIP MILL AREA	97.1	3.0	**
28	CONVEYOR	99.7	2.1	**
29	DROP FORGE AREA	82.7	8.0	
30	BLAST FURNACE AREA	59.5	8.0	

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

FABRICATED METAL PRODUCTS — 1057 THOUSAND PRODUCTION WORKERS

	MACHINES	NOISE DBA	TOL. HOURS
1	FRICTION SAW	108.1	.6 **
2	MILLING MACHINE	90.5	7.5 **
3	BORING MACHINE	97.5	2.8 **
4	PNEUMATIC PRESS	101.0	1.7 **
5	HOB-GRINDER	90.7	7.2 **
6	MULTIPLE DRILL	96.1	3.4 **
7	TURRET LATHE, RAM TYPE	107.4	.7 **
8	SPROCKET GRINDER	91.0	6.9 **
9	HAND GRINDER	95.1	3.9 **
10	STAND GRINDER	93.4	5.0 **
11	NAIL MACHINE	109.6	.5 **
12	HOOP MACHINE	98.3	2.5 **
13	FENCE WIRE MACHINE	102.6	1.4 **
14	WIRE DRAWING MACHINE	91.3	6.6 **
15	FENCE MACHINE	92.5	5.6 **
16	WIRE DRAWING MACHINE	85.6	8.0
17	TURRET LATHE	90.5	7.5 **
18	TRACER LATHE	89.7	8.0 *
19	TURRET LATHE	92.0	6.1 **
20	GEAR SHAPER	88.0	8.0 *
21	VERTICAL RADIAL DRILL	93.0	5.3 **
22	TURRET LATHE	98.9	2.3 **
23	ARC WELDER	85.6	8.0
24	AUTOMATIC DROP HAMMER	111.9	.4 **
25	AUTOMATIC PUNCH PRESS	107.6	.7 **
26	PEDESTAL GRINDER	106.4	.8 **
27	CUTTING MACHINE	106.9	.8 **
28	SAND BLAST MACHINE	118.9	.1 **
29	LEAD POT FURNACE	80.8	8.0
30	LEAD STIRRING MOTOR	111.8	.4 **
31	PNEUMATIC VIBRATOR	102.1	1.5 **
32	CORE BLOWER, SAND CORES	102.3	1.5 **
33	SAND MULLER, 1500 LBS.	90.2	7.8 **
34	TUMBLER	97.9	2.7 **
35	SHOT BLAST	98.5	2.5 **
36	PRE-MIX BURNER	85.5	8.0
37	BLOWER, FOR CUPOLA	87.5	8.0 *
38	MILLING MACHINE	91.1	6.9 **
39	PNEUMATIC HAMMER	104.2	1.1 **
40	BUTT WELDER, ELECTRIC	91.9	6.2 **
41	BACK SHEAR, FOUR-CUTTER	93.8	4.7 **
42	ROLL GRINDER	85.8	8.0
43	SHAPER, SMALL STEEL PARTS	94.5	4.3 **
44	CORRUGATING MACHINE	111.9	.4 **
45	DOWNSPOUT ROLL	92.0	6.1 **
46	CORRUGATING MACHINE	114.4	.3 **

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

		NOISE DBA	TOL. HOURS	
47	LIMING MACHINE	85.7	8.0	
48	AUTOMATIC SCREW MACHINE	93.3	5.0	**
49	CHIP SEPARATOR SHAKE TABLE TYPE	92.6	5.6	**
50	AUTOMATIC SCREW MACHINE	87.9	8.0	*
51	HOT BOLT HEAD UPSETTER	111.8	.4	**
52	TOGGLE MACHINE, COLD HEADER	97.8	2.7	**
53	PUNCH PRESS	100.0	2.0	**
54	NUT FORMER	91.2	6.8	**
55	TUMBLER, NUTS, BOLTS	94.7	4.2	**
56	NUT TAPPER	94.4	4.3	**
57	AUTOMATIC SCREW SLOTTER	96.1	3.4	**
58	ROLL THREADER	92.2	5.9	**
59	SPIN RIVETER	104.1	1.1	**
60	RADIAL DRILL PRESS	87.1	8.0	*
61	AUTOM. LATHE	89.5	8.0	*
62	MULTIPLE DRILL PRESS	88.4	8.0	*
63	VERT. TUR. LATHE	87.4	8.0	*
64	TUMBLER	87.3	8.0	*
65	AUTOM. RADIATOR WASHERS	92.9	5.4	**
66	FURNACES, NON-FERROUS	95.5	3.7	**
67	ROUTER, ON ALUMINUM STOCK	87.4	8.0	*
68	HAND OPERATED PNEU. DRILL	91.2	6.8	**
69	AUTOM. SCREW MACHINE	95.5	3.7	**
70	WELDED TUBE MACH.	81.2	8.0	
71	GRINDING MACHINE	94.2	4.4	**
72	ELECTRIC HAND GRINDER	90.0	8.0	*
73	GRINDING MACHINE	97.7	2.8	**
74	GRINDING MACHINE	96.4	3.3	**
75	GRINDING MACHINE	90.1	7.9	**
76	POLISHER	94.8	4.1	**
77	HAND GRIND	85.7	8.0	
78	POINTING MACHINE, STEEL PARTS	91.7	6.3	**
79	STEEL CONVEYOR	109.1	.6	**
80	ROTARY HAMMERING MACHINE	96.3	3.4	**
81	PIPE MILL, PROCESSING PLATFORM	94.5	4.3	**

AREAS		NOISE DBA	TOL. HOURS	
1	MACHINE SHOP LATHES PRESSES ETC	84.3	8.0	
2	MACHINE SHOP LATHES HOB-GRINDERS	84.4	8.0	
3	METAL WORKING GRINDING	84.2	8.0	
4	GRINDING AREA	89.9	8.0	*
5	NAIL MANUFACTURING AREA	103.1	1.3	**
6	STEEL WIRE FENCE MANUFACTURING	102.6	1.4	**
7	WIRE DRAWING AREA	91.3	6.6	**
8	STEEL WIRE FENCE MANUFACTURING	92.5	5.6	**
9	MACHINE SHOP, LATHES, BORERS	80.0	8.0	
10	ARC WELDING AREA, STEEL PARTS	82.5	8.0	
11	AUTOMATIC DROP HAMMER AREA	106.3	.8	**
12	AUTOMATIC PUNCH PRESS AREA	103.3	1.3	**
13	GRINDING AREA	89.0	8.0	*
14	GRINDING AREA	84.9	8.0	

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

		NOISE DBA	TOL. HOURS	
15	MILLING MACHINE AREA	84.1	8.0	
16	HEAT TREATING AREA, LEAD POTS,	78.5	8.0	
17	SAND MOLDING AREA	76.3	8.0	
18	CORE AREA, NOISE DUE TO AIR BLAST	73.7	8.0	
19	SHOT BLAST AREA	81.8	8.0	
20	STEEL POUR AREA	83.0	8.0	
21	CUPOLA AREA, CUPOLA DOWN	87.5	8.0	*
22	TOLL MFR. AREA	81.2	8.0	
23	ROLLING MILL MACH. SHOP	85.9	8.0	
24	ROLLING MILL MACH. SHOP	73.9	8.0	
25	CORRUGATING AREA	97.2	3.0	**
26	STRIP STEEL PROCESSING	81.7	8.0	
27	SCREW MACHINE AREA, BOLTS	91.7	6.3	**
28	AUTOMATIC SCREW MACHINE AREA NUTS	84.0	8.0	
29	AUTOMATIC SCREW MACHINE AREA	90.9	7.1	**
30	AUTOMATIC SCREW MACHINE AREA	78.4	8.0	
31	LIGHT RIVETING AAEA	75.2	8.0	
32	MACHINE SHOP, DRILL PRESSES	83.8	8.0	
33	MACHINE SHOP, DRILL PRESSES	81.9	8.0	
34	MACHINE SHOP, DRILL PRESSES	86.0	8.0	
35	MACHINE SHOP, DRILL PRESSES	83.6	8.0	
36	MACHINE SHOP, DRILL PRESSES	80.8	8.0	
37	MACHINE SHOP, DRILL PRESSES	82.3	8.0	
38	MACHINE SHOP, DRILL PRESSES	83.1	8.0	
39	PUNCH PRESS DEPARTMENT	92.1	5.9	**
40	NON-FERROUS FOUNDRY FURNACE AREA	95.5	3.7	**
41	RADIATOR PROCESSING AREA	92.9	5.4	**
42	MACHINE SHOP SCREW MACHINES METAL	87.0	8.0	*
43	MACHINE SHOP LATHES GRINDER SAWS	75.1	8.0	
44	STOREROOM, TOOLS, MATERIALS	52.3	8.0	
45	PICKLING AREA	79.5	8.0	
46	STEEL FABRICATION AREA	83.0	8.0	
47	STEEL FABRICATION AREA	86.7	8.0	
48	STEEL FABRICATION AREA	93.8	4.8	**
49	SHIPPING DEPT. (STEEL PLANT)	69.8	8.0	
50	STEEL FINISHING DEPT	74.8	8.0	
51	STEEL POLISH AND GRIND AREA	90.0	8.0	*
52	STEEL HANDLING AREA	88.6	8.0	*
53	STEEL PARTS SAWING AREA	83.0	8.0	
54	STEEL PROCESSING AREA	90.8	7.1	**
55	STEEL WORKING AREA	85.3	8.0	
56	POWER PLANT AREA, ALTERNATORS	87.3	8.0	*
57	SHIPPING DEPARTMENT	73.4	8.0	

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

MACHINERY 1349 THOUSAND PRODUCTION WORKERS

MACHINES	NOISE DBA	TOL. HOURS
1 ENGINE DYNAMOMETER STAND	96.5	3.3 **
2 PNEUMATIC WRENCH	102.6	1.4 **
3 MILLING MACHINE	90.5	7.5 **
4 BORING MACHINE	97.5	2.8 **
5 PNEUMATIC PRESS	101.0	1.7 **
6 HOB-GRINDER	90.7	7.2 **
7 MULTIPLE DRILL	96.1	3.4 **
8 TURRET LATHE	107.4	.7 **
9 WELDER, 600 AMO.	111.9	.4 **
10 PNEU. RIVETING HAMMER	128.2	.0 **
11 PNEU. CHIPPER	128.6	.0 **
12 PNEU. CHIPPER	126.3	.1 **
13 PNEU. CHIPPER	127.6	.0 **
14 HAND GRINDER ELECTRIC	96.3	3.4 **
15 ARC WELDER	85.6	8.0
16 PNEU. AIR HOIST, 4000 LB.	101.2	1.7 **
17 PNEU. WRENCH, ON ENGINE NUTS	105.9	.9 **
18 INT. COMB. ENGINE TEST, 150 HP	99.4	2.2 **
19 STEEL PLATE SHEAR	94.9	4.1 **
20 BACK SHEAR, FOUR-CUTTER	93.8	4.7 **
21 ENGINE LATHE	90.4	7.6 **
22 ENGINE LATHE	87.8	8.0 *
23 GAS WELDER	94.9	4.0 **
24 GAS ENGINE TEST	93.8	4.7 **
25 GAS ENGINE TEST	114.9	.3 **
26 STUD DRIVER, PNEU.	94.5	4.3 **
27 AUTOMATIC RADIATOR WASHER	92.9	5.4 **
28 RIVETING JIG	117.4	.2 **
29 INT. COMB. ENGINE TEST, 1500 HP	115.1	.2 **

AREAS	NOISE DBA	TOL. HOURS
1 SHOT BLAST ROOM	98.6	2.4 **
2 ENGINE DYNAMOMETERS	92.0	6.1 **
3 MACHINE SHOP LATHES PRESSES	84.3	8.0
4 MACHINE SHOP HOB GRINDING AREA	84.4	8.0
5 ASSEMBLY SHOP	87.3	8.0 *
6 PNEU. RIVET. AREA	105.3	1.0 **
7 PNEU. CHIP. AREA, CLEANING STEEL	114.6	.3 **
8 HAND GRINDING AREA, STEEL PLATE	79.1	8.0
9 ARC WELDING AREA, STEEL PARTS	82.5	8.0
10 PNEU. AIR HOIST, 4000 LB.	82.3	8.0
11 INT. COMB. ENG. TESTING	79.8	8.0
12 EARTH MOVING EQUIPMENT ASSEMBLY	85.7	8.0
13 STEEL PLATE SHEAR	94.9	4.1 **
14 ENGINE LATHE	86.9	8.0
15 ENGINE LATHE	80.2	8.0

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

		NOISE DBA	TOL. HOURS
16	COMPRESSOR TEST	100.5	1.9 **
17	ENGINE TEST, 50 HP. INT. COMB.	98.4	2.5 **
18	MACHINE SHOP LATHES DRILLS	81.9	8.0
19	MACHINE SHOP AREA LATHES DRILLS	76.8	8.0
20	PUNCH PRESS ROOM	86.7	8.0
21	PUNCH PRESS ROOM	90.8	7.2 **
22	PUNCH PRESS ROOM	97.3	2.9 **
23	PUNCH PRESS ROOM	100.1	2.0 **
24	INT. COMB. ENG. TEST AREA 1500 HP	102.4	1.4 **
25	RADIATOR PROCESSING AREA	92.9	5.4 **

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

AIRCRAFT MANUFACTURE 489 THOUSAND PRODUCTION WORKERS

MACHINES	NOISE DBA	TOL. HOURS
1 PNEU. RIVETING GUN, SUB-ASSEMBLY	133.2	.0 **
2 PNEU. RIVETING GUN, SUB-ASSEMBLY	123.3	.1 **
3 PNEU. RIVETING GUN	109.2	.6 **
4 RIVETING HAMMER	106.2	.8 **
5 PNEUMATIC DRILL	91.1	6.8 **
6 BUMPING HAMMER, ON THIN METAL	113.8	.3 **
7 CIRCULAR SAWS, CUTTING METAL	104.7	1.0 **
8 RIVRT BUCKING, WINGS	107.0	.8 **
9 RIVET BUCKING, FUSELAGE	93.1	5.2 **
10 ROUTER, ON ALUMINUM STOCK	87.4	8.0 *
11 HAND OPERATED PNEU. DRILL	91.2	6.8 **
12 RIVETING JIG, WING ASSEMBLY	117.4	.2 **

AREAS	NOISE DBA	TOL. HOURS
1 ROUTERS, RIVETING	85.1	8.0
2 ALUMINUM MACHINING	77.7	8.0
3 SUB ASSEMBLY, LIGHT RIVETING	79.3	8.0
4 SUB ASSEMBLY, DISTANT RIVETING	78.7	8.0
5 SUB ASSEMBLY, DISTANT RIVETING	88.2	8.0 *
6 WING ASSEMBLY, DISTANT RIVETING	90.3	7.7 **
7 FUS. ASSEM., DIST. RIVETING	81.5	8.0
8 FUS. ASSEM., DIST. RIVETING	75.5	8.0
9 SUB ASSEMBLY, DIST. RIVETING	74.7	8.0
10 ASSEMBLY, DISTANT RIVETING	77.7	8.0
11 ASSEMBLY, DISTANT NOISES	80.4	8.0
12 ASSEMBLY, DISTANT NOISES	82.8	8.0
13 ASSEMBLY, DISTANT NOISES	77.7	8.0
14 ASSEMBLY, DISTANT NOISES	72.1	8.0
15 SMALL PARTS ASSEMBLY	78.9	8.0
16 WING RIVET. BUCKING AREA	79.3	8.0
17 STAMPING SHEARS, GRINDING	80.4	8.0
18 RIVETERS, ROUTERS, GRINDERS	85.5	8.0
19 WING ASSEMBLY, DISTANT RIVETING	85.4	8.0
20 WING ASSEMBLY, DISTANT RIVETING	83.9	8.0
21 MAIN ASSEMBLY, DISTANT RIVET L, MI	81.7	8.0
22 FUSELAGE ASSEMBLY, DIST RIVETING	83.9	8.0
23 ROUTER AREA, DISTANT RIVETING	91.2	6.8 **
24 SMALL PARTS ASSEMBLY	86.2	8.0
25 SMALL PARTS ASSEMBLY	81.6	8.0
26 WING DEPT., SM. SAWS, ALUMINUM	81.1	8.0

* SMALL MARGIN OF SAFETY (LESS THAN 3 DBA)
** ACTION REQUIRED

A-1386

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE of TECHNOLOGY

Physical Sciences Division
225 North Avenue N. W.
Atlanta, Georgia 30332
(404) 873-4211 Ext.5625

February 11, 1972

Mr. Howard Crispin
Vice President, Corporate Development
Scientific Atlanta, Inc.
Box 13654
Atlanta, Georgia 30332

Subject: Monthly Progress 2; Project A-1386,--Noise Exposure Meter

Dear Mr. Crispin:

Progress on the subject meter has been limited mainly to further definition of some of the circuit elements.

Those components which are less readily available have been ordered, and assembly will proceed as they are received.

Further search of census material has as yet failed to reveal data showing the relative numbers of productive workers employed in the individual occupations listed in the previous report.

Very truly yours,

Louis C. Young
Project Director

LCY/ml

A-1386

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE of TECHNOLOGY

Physical Sciences Division
225 North Avenue N. W.
Atlanta, Georgia 30332
(404) 873-4211 Ext.5625

March 13, 1972

Mr. Howard Crispin
Vice President, Corporate Development
Scientific-Atlanta, Inc.
Box 13654
Atlanta, Georgia 30332

Subject: Monthly Progress 3; Project A-1386 -- Noise Exposure Meter

Dear Mr. Crispin:

Work is progressing on assembly of the subject meter, after some interruption of the original schedule due to delay in delivery. We appreciate your recent help in supplying the needed precision resistors, relieving us from a further delay.

Some difficulty is also being experienced with respect to the catalytic recombination of gases, requiring a change in design or possibly in method. (Specifically, we have not yet been able to avoid wetting of the catalyst.)

Present circumstances suggest that the completion of remaining work may require as much as one month. I trust that an extension in time of this extent will not seriously inconvenience you, for I feel that the added time will be fruitful.

Very truly yours,

Louis C. Young
Project Director

LCY:brj